

7. (Amended) A method for repairing a metallic pattern on a substrate according to claim 6, wherein the output of said semiconductor laser is increased, and wherein the substrate is cooled thereafter.

8. (Amended) A method for repairing a metallic pattern on a substrate according to claim 5, further comprising a step of removing a protruding portion of a deposited metallic thin film from said metallic pattern.

REMARKS

In view of the preceding amendments and the comments which follow, and pursuant to 37 C.F.R. § 1.111, amendment and reconsideration of the Official Action of March 13, 2002 is respectfully requested by Applicants.

Amendment to the Specification

The specification has been amended to correct obvious typographical errors such as the unintentional use of the term "defective" where the term "defect" was intended. The paragraph on page 6, lines 20-28 has been amended to correct the apparently unintentional omission of the words "on an." The changes from the previous version to the rewritten version are shown in attached Appendix A, with strikethroughs for deleted matter and underlines for added matter. No new matter has been added as a result of these amendments.

Amendments to Claims

Claim 5 has been amended to correct the typographical error "defective" where the term "defect" was obviously intended. In addition, claim 5 has been amended to replace "heating" with "subjecting" and to add the phrase "a provisional baking process using a laser and a main baking process." Claim 6 has been amended to replace the

term "heating" with "baking." Claim 7 has been amended to delete the phrase "wherein said metallic organic compound is first subjected to a provisionally baking process and second to a main baking process." Claim 8 has been amended to correct the inadvertent omission of the word "said." The changes from the previous version to the rewritten version are shown in attached Appendix B, with strikethroughs for deleted matter and underlines for added matter. The amendments find support in the specification. No new matter has been added as a result of these amendments.

Claims 5-8, 14, and 15 are pending following entry of the present amendment.

Rejection under 35 U.S.C. § 102(b)

The Examiner has rejected claims 5-8, 14, and 15 as being anticipated by U.S. Patent No. 5,164,565 ("Addiego") under 35 U.S.C. § 102(b). According to the Examiner, Addiego teaches a laser-based system for material deposition and removal, which include applying a metallo-organic compound to a defective portion, heating the compound with a laser, provisionally and mainly baking the metallo-organic compound, and removing an unwanted portion from the substrate. In addition, the Examiner has rejected claims 5 and 6 as being anticipated by U.S. Patent Nos. 4,609,566 ("Hongo") and 5,079,070 ("Chalco") and JP 04-243231 ("Fujitsu") under 35 U.S.C. § 102(b). According to the Examiner, Chalco, Hongo, and Fujitsu each teach a method of repairing including applying an organometallic compound and heating with a laser.

In response, Applicants respectfully submit that each of the above references cited by the Examiner does not anticipate the invention as presently claimed. In Addiego, the provisional baking process is performed by heating the metallo-organic material using internal heating elements incorporated in the wafer chuck (column 9, lines 6-11). In contrast, the method of the present invention performs the provisional baking process using a laser. Thus, the method of the present invention is simpler and more economical than Addiego because, for one, the present invention makes unnecessary the installation of internal heating elements to bake the metallo-organic

material. Because Addiego does not disclose each limitation of the claimed invention, Applicants respectfully submit that Addiego does not anticipate the present invention.

As with Addiego, Hongo's provisional baking process is performed by heating the metallo-organic material using built-in heating elements (column 3, lines 5-7; column 4, lines 27-29). In contrast, the method of the present invention performs the provisional baking process using a laser. Thus, the method of the present invention is simpler and more economical than that of Hongo because, for one, the present invention obviates the need for installing a heating element for provisionally baking the metallo-organic material. Because Hongo does not disclose every limitation of the claimed invention, Applicants respectfully submit that Hongo does not anticipate the present invention.

Chalco requires the repair of open defects via diffusion bonding and the combined application of ultrasonic and laser energy (See, for example, the abstract, claim 8, and column 2, lines 5-7.). Specifically, Chalco teaches a method of repairing open defects by forming a pattern of conductive lines onto a support sheet and selectively bonding one of the lines in position to repair an open defect in a conductor line using combined ultrasonic and laser energy (column 1, lines 11-15).

Chalco does not teach subjecting a metalloorganic material to a provisional and main baking process using a laser to deposit a metallic thin film on a defect. In contrast to Chalco, the present invention does not require the use of a combined ultrasonic and laser energy to repair a defect in, for example, a metallic pattern. In particular, the present invention does not involve repairing open defects such as by forming a pattern of conductive lines onto a support sheet and selectively bonding one of the lines in position to repair an open defect in a conductor line using a combined ultrasonic and laser energy. Thus, the method of the present invention is much less complicated than that of Chalco. Because Chalco does not disclose every limitation of the claimed invention, Applicants respectfully submit that Chalco does not anticipate the present invention.

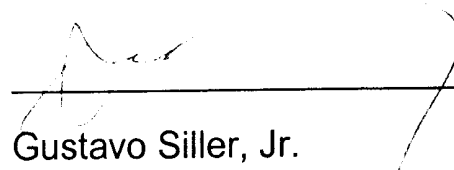
Fujitsu does not disclose subjecting the organometallic compound to a provisional and main baking process to deposit a metallic thin film on a defect in, for example, a metallic pattern. Fujitsu merely discloses "irradiating the parts before and behind a disconnected point 28 with a laser beam 6 to dissolve the top coat layer 27 so as to short circuit the transparent electrode 23 and the black mask 5." (Underline added.) In Fujitsu, the top coat layer, which consists of a transparent resin, lies between the black mask and the transparent electrodes. Thus, the transparent resin already preexists before the actual repair process not only at or near a defect, such as a disconnected point, but also in at least a substantial part of Fujitsu's display element which is defect-free. Also, Fujitsu repairs the defect by short-circuiting the transparent electrode and the black mask. Unlike Fujitsu, the present invention does not perform the repair by short-circuiting a black mask and an electrode by dissolving a preformed top coat layer made of resin that initially separated the black mask and the electrode. At the very least, not requiring performing or predeposition of a repair material over even the defect-free part of, for example, a metallic pattern clearly makes the present invention simpler and more economical than Fujitsu. Because Fujitsu does not disclose every limitation of the claimed invention, Applicants submit that Fujitsu does not anticipate the present invention.

Based on the above, Applicants respectfully request that the rejection of claims 5-8, 14, and 15 under 35 U.S.C. § 102(b) be withdrawn.

Conclusion

Applicants submit that their application is now in condition for allowance, and favorable reconsideration of their application in view of the above amendments and remarks is respectfully requested. Allowance of claims 5-8, 14, and 15 at an early date is earnestly solicited.

Respectfully submitted,



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APPENDIX A
Attorney Docket No. 9281/3898
SUBSTRATE HAVING REPAIRED METALLIC
PATTERN AND METHOD AND DEVICE FOR
PREPARING METALLIC PATTERN ON SUBSTRATE

OSAMU, Sakai et al.
Serial No. 09/748,530

Please amend the following paragraphs as shown:

On page 1, lines 28-30,

(Amended) (W) an organoindium compound solution is applied to the open defective defect and then is heated to transform the applied film of the organoindium compound into a conductive layer (Japanese Unexamined Patent Application No. 3-85523),

On page 2, lines 3-6,

(Amended) (Y) an adhesive comprising fine plastic particles is applied to an open defective defect of a bump (Japanese Patent Application Laid-open No. 2-301723),

(Z) a conductive material is applied to an open defective defect and then laser irradiation is applied thereto (Japanese Patent Application Laid-Open No. 2-301723).

On page 6, lines 16-19,

(Amended) FIG. 1A, FIG. 1B and FIG. 1C schematically show steps of a method for repairing a broken defect, Fig. 1A shows a[.] state in which paste 1 comprising metallic organic compound is applied on an open-defective defect 6, FIG. 1B shows a state of heating the paste 1, and FIG. 1C shows the repaired state of the open defective defect 6 after heating.

On page 6, lines 20-28,

(Amended) In FIG. 1A, a substrate 10 shows a state of the substrate before repairing, in which paste 1 comprising metallic organic compound and an electrode 3 are laminated on a glass substrate 2. Glass substrate 2 is an ordinary substrate, and electrode 3 is made of ordinary material of ITO, or the like, and is formed in a line by patterning and etching on glass substrate 2 in an equal width and in an equal pitch. Further, paste 1 comprising metallic organic compound is formed by a transfer unit 4 on an open defective defect 6 of electrode 3 on the glass substrate 2. Open defect 6 is made in electrode 3 by a foreign substance mixed in the film plane of ITO or the like when electrode 3 is formed using an etching process (see FIG. 9C).

On page 10, lines 21-26,

(Amended) During the manufacture of mask 20, a metallic pattern is formed on glass substrate 21 to create an opaque film 22. Sometimes during the manufacturing process, a ~~defective~~ defect 24, shown in FIG. 8, might be accidentally formed on opaque film 22. To repair defect 24, paste 23 is transferred to defect 24 and is baked to repair defect 24. In this case, same metallic organic compound described above, to be more specific, gold paste of gold-resinate-based MOD (metalloorganic deposition) type can be used as paste 23.

On page 11, lines 1-7,

(Amended) The ~~defective~~ defect repaired in the manner described above sometimes has a portion protruding from the metallic pattern of opaque film 22 (the diagonally shaded area in FIG. 8) and the portion protruding from the metallic pattern is required to be removed because the quality of mask 20 is deteriorated in this state (in the case of the electrode, the part sticking out from the metallic pattern is acceptable, if the part is not short-circuited). To remove the protruding portion, a device for applying laser irradiation such as YAG laser is used.

On page 11, lines 10-13,

(Amended) According to the present invention, even if an open defective defect is detected in an electrode, the defective defect can be repaired by a metallic thin film of high quality that has good electric characteristics that avoids the need to heat the substrate, which can damage a substrate.

On page 11, lines 14-19,

(Amended) Further, according to the present invention, only the paste placed in the defective defect is heated and other portions of the substrate are not heated by the semiconductor laser used to bake the paste, and hence the substrate does not suffer damage. Furthermore, the metal in the defective defect is treated by a baking process comprising provisional baking and main baking process and a cooling process, and hence a dense metallic thin film with no cracks can be produced.

APPENDIX B

Attorney Docket No. 9281/3898
SUBSTRATE HAVING REPAIRED METALLIC
PATTERN AND METHOD AND DEVICE FOR

PREPARING METALLIC PATTERN ON SUBSTRATE

OSAMU, Sakai et al.
Serial No. 09/748,530

Please rewrite claims 5-8 as follows:

5. (Amended) A method for repairing a metallic pattern on a substrate, said method comprising steps of:

applying a metallic organic compound to a defective defect in a metallic pattern overlying said substrate; and

heating subjecting said organic compound to a provisional baking process using a laser and a main baking process deposit a metallic thin film in said defective defect.

6. (Amended) A method for repairing a metallic pattern on a substrate according to claim 5, wherein energy from a semiconductor laser is used as a heat source for heating baking said metallic organic compound.

7. (Amended) A method for repairing a metallic pattern on a substrate according to claim 6, ~~wherein said metallic organic compound is first subjected to a provisionally baking process and second to a main baking process,~~ wherein the output of said semiconductor laser is increased, and wherein the substrate is cooled thereafter.

8. (Amended) A method for repairing a metallic pattern on a substrate according to claim 5, further comprising a step of removing a protruding portion of a deposited metallic thin film from said metallic pattern.